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Boiotremus fukuiensis, n. sp. from Fukuji, Gifu Prefecture

—First Recorded Devonian Gastropod from Japan—

By

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加瀬友喜*・西田民雄**・児子修司***：日本産デボン紀腹足類の
初記録および1新種

Introduction

The Fukuji Formation, one of the well-known and the most continuous sequence of the Lower Devonian of Japan, yields a rich fauna consisting of tabulate and rugose corals, nautiloids, brachiopods, ostracods, trilobites, and others. Contrary to the diversified nature of these fossils, no gastropod and bivalve have heretofore been described from this formation. This fact is also the same for other Devonian formations in Japan. During the course of investigation in the stratigraphic succession of the Lower Devonian Fukuji Formation by one of us (S. NIKO) it has become evident that the gastropods and bivalves are not uncommon in this formation. The materials of these fossils are now accumulating gradually through fossil huntings by many fossil collectors in this area. The fossil gastropods and bivalves, however, are not well preserved, and we need a larger and better collection of well-preserved specimens to understand the nature of the molluscan fauna of the Fukuji Formation. Among the fossil gastropods, one species, which can be assigned to a new species of tremanotiform bellerophontaceans, is preserved well enough to be described. This is the first record of a gastropod from the Devonian of Japan.

We thank Prof. Yuji OKIMURA of Hiroshima University, who provided us the opportunity of this study. We also thank Miss Yuko KYUMA of Yagami Elementary School, Nagasaki for her capable help in the field and laboratory. Mr. Teruo ONO has generously donated the specimens to the National Science Museum and has searched for additional material. This study is a contribution of JTAF (Studies on Japanese Trilobites and Associated Fossils, conducted by Dr. T. KOBAYASHI) no. 40.

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Locality and Stratigraphy

Richly fossiliferous and calcareous sediments of the Devonian Fukuji Formation are exposed in a small area 1.2 km long and 0.4 km wide, in the southern part of the Hida Massif, central Japan. It is about 260 m thick in total and consists mainly of black limestone, black shale and tuff. The gastropods were collected along a small roadside cliff (locality NSM PCL10-45-1) on the southeast flank of the Mt. Sorayama, west of Fukuji, Kamitakara-mura, Gifu Prefecture (Fig. 1).

The stratigraphic succession of the Lower Devonian Fukuji Formation was extensively investigated by KAMEI (1952, 1955), OHNO (1977) and NIHKAWA (1980). OHNO divided this formation into three members; Lower, Middle and Upper Members, and also subdivided it into 14 beds (Bed A to Bed N in upward sequence). The fossil gastropods described in this paper were collected from OHNO's Bed B of the Lower Member (Fig. 2). This bed, about 10 m thick, consists of stratified black calcareous shale with intercalations of black impure limestone beds. It yields brachiopods commonly, and straight cephalopods, bivalves, gastropods, trilobites, etc. sporadically. OHNO (1977) described 13 species of the brachiopods and IGO *et al.* (1975) reported three species of simple-cone type conodonts from this bed.

Various opinions have been expressed on the geological age of the Fukuji Formation. KOBAYASHI & HAMADA (1974), based on their studies of trilobites, concluded that the Fukuji Formation is within the range of upper Siegenian to lower (?) Eiferian. Furthermore, the presence of the lowest Gedennian sediments in this formation was confirmed with conodonts by IGO *et al.* (1975). The locality NSM PCL10-45-1 is very near one where IGO *et al.* reported Gedinnian conodonts; the stratigraphic level of the former locality is apparently about 10 m below the latter.

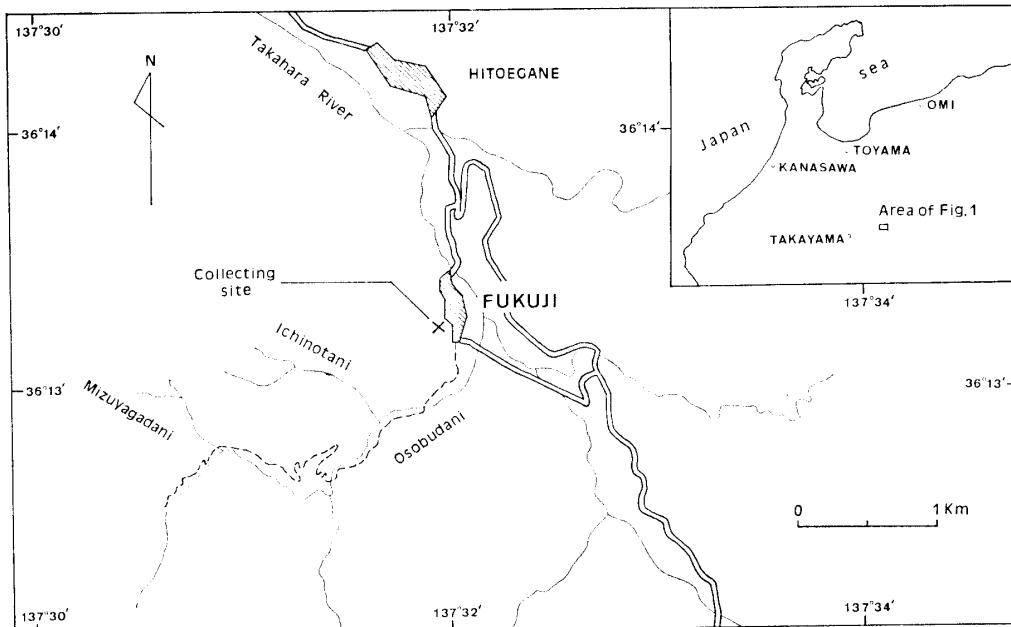


Fig. 1. Map showing the fossil locality (NSM PCL10-45-1).

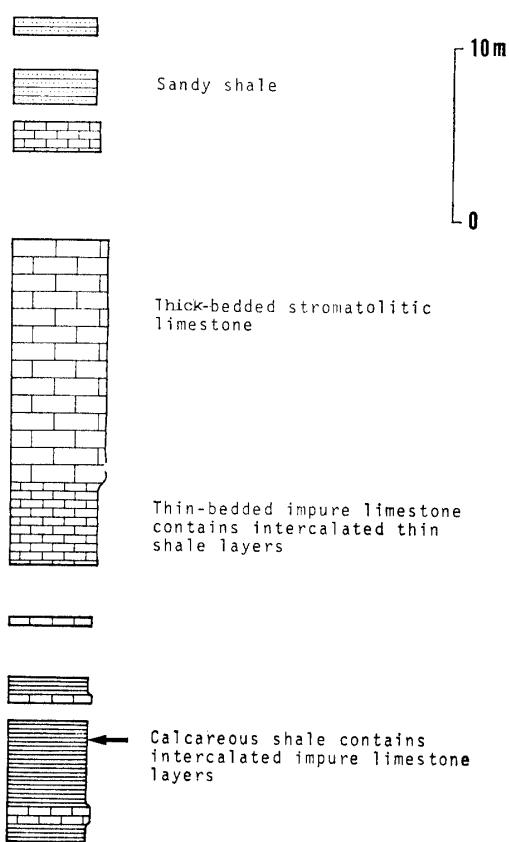


Fig. 2. Stratigraphic column of the Lower Member of the Fukuji Formation measured along a valley just behind the "Fukuji Fossil Garden". Arrow indicates the stratigraphic level of the fossil occurrence.

Systematic Paleontology

Genus *Boiotremus* HORNÝ, 1962

Type species. *Tremanotus fortis* FRECH, 1894 from the Lower Devonian of Czechoslovakia. [original designation]

Boiotremus fukuiensis, n. sp.

(Pl. 1, Figs. 1, 2; Pl. 2, Figs. 1, 2)

Type and material. Holotype [IGSHK0001, S. NIKO coll.]. Three paratypes [NSM-PM15305, 15306, Y. KYUMA coll.; unregistered specimen of Hida Museum of Natural History, T. NISHIDA coll.].

Diagnosis. Large species of *Boiotremus* characterized by having widely expanded aperture that is oval in shape. Ornamentation consisting of wavy fine spiral cords.

Description. Shell large for the genus, thin, tremanotiform in outline. Length of shell about 1.5 times as large as wide. Early whorls unknown owing to ill-preservation, but rounded on dorsal area, on which a weak and narrow crest is present. Dorsal area of whorls ornamented by round-topped spiral cords. On the dorsal side of the whorls a row of tremata is developed, numbering four per 16 mm on the body whorl of the holotype. Tremata is small, but their exact shape is unknown. Aperture widened, oval in outline, broadly

rounded anteriorly, but narrowed posteriorly. Anterior margin with a very weak sinus in the holotype which is the extension of the median crest. Widened apertural plane is slightly reflected at margin and smooth internally. Outer surface of the aperture ornamented by numerous and wavy spiral ribs of variable prominence. Growth lines fine and crowded.

Measurements in mm.

Specimen	Length	Width
IGSH K0001 Holotype	106.7	69.0
NSM-PM15305 Paratype	122.1	83.2
NSM-PM15306 Paratype	101.2	71.0
Hida Mus. Nat. Hist., unregistered Paratype	ca. 140	87.3

Discussion. Four specimens are available for this study. These specimens are all severely compressed dorso-ventrally and, as a consequence, show only the last one volution. Umbilical features are unknown in all the specimens. The holotype clearly shows the outer surface of the widely expanded body whorl. The slightly asymmetric nature of this specimen may be due to lateral deformation. In this specimen the three most anterior tremata are visible, which seem to be perforated. The tremata are also present on the median crest of the adapertural and ventral part of the body whorl represented by weak, small and slightly prolonged swellings on the internal mold. These tremata are four in number in a 17 mm length of whorl and seem to be concealed internally. However, the median crest and tremata seem to weaken posteriorly in this specimen. No specimen shows the ventral surface of the early whorls, so that it is impossible to trace the median crest and tremata on them. One of the paratypes (Pl. 1, Fig. 1) also shows the presence of the median crest, on which weak tremata are recognized. This specimen has a distinct but irregular constriction of whorl on the ventral side of the body whorl. This is what HORNÝ (1962) called the periodic aperture.

HORNÝ (1962) distinguished two genera among the species once assigned to *Tremanotus* and erected *Boiotremus* based on *B. fortis* as its type species. The two are distinguished in that *Tremanotus* possesses a slit represented by a row of tremata that are present only on the body whorl, but *Boiotremus*, on the other hand, possesses a slit also represented by a row of tremata that are present through all the growth stage. Also HORNÝ (1962) pointed out that *Boiotremus* has periodic apertures represented by constrictions on the whorls. The presence of the tremata on the slit in the younger growth stage is in many cases very difficult to recognize, because the younger whorls are overlapped by succeeding whorls. TASSELL (1976), on the other hand, had an opposite opinion; that the two genera are not distinguishable from each other because the type species of *Tremanotus*, *T. alpheus* HALL, 1865, has the tremata extending on the early whorls. Further investigation is necessary to clarify the relationship between *Tremanotus* and *Boiotremus* by examining *T. alpheus*.

Unfortunately, the specimens from the Fukuji Formation are all ill-preserved and the characteristics of the tremata on the slit of the early whorls are unknown. This species, however, seems to be assigned to *Boiotremus*, because it possesses a constriction on the body whorl which may represent a periodic aperture.

Boiotremus fukuiensis is distinguished from *Boiotremus berauensis* (PERNER, 1903) from the Silurian of Bohemia by having a larger shell size, a more widely expanded aperture that is oval in outline, and more evolute whorls. It is similar to *Boiotremus insectus* (FRECH, 1894) from the Lower Devonian of Bohemia, which was assigned to *Boiotremus* by HORNÝ (1962), but differs in having more widely expanded aperture and in lacking an incised axial sculpture.

Tremanotus pritchardi CRESSWELL, 1893 (TASSELL, 1976) from the Lower Devonian of Victoria, Australia is related to *B. fukuiensis*. The Victorian species, however, has an aperture that is not as widely expanded as the Japanese species.

要 約

岐阜県上宝村福地地域に狭く露出する福地層は、本邦の下部デボン系の標準地層の1つであり、豊富な動物化石を産することで知られている。これまでにサンゴ類、腕足類、三葉虫類などについて古生物学的研究がなされている。しかし、軟体動物化石をはじめとして、多くの分類詳の化石が未研究のままで残されている。

福地層の軟体動物化石は必ずしも保存が良くないが、ベレロフォン超科の *Boiotremus* 属の保存の良い化石が得られたので、これを *B. fukuiensis* n. sp. として記載した。これは本邦のデボン系から初めて記載された腹足類である。

この種は体層のみが保存されているために初期螺層の切れ込み上の穿孔の有無を決定できないが、螺層上に明瞭なくびれがあるので *Boiotremus* 属に所属すると考えられる。本種はボヘミアのシルル系から知られる *Boiotremus berauensis* (PERNER) に似るが、殻は大型で広く拡がった卵円形の殻口をもつことで区別される。本種はボヘミアの下部デボン系の *Boiotremus insectus* (FRECH) に似るが、より広く拡がる殻口をもつこと、異なる表面装飾をもつことで区別される。また本種はビクトリアの下部デボン系より知られる *Tremanotus pritchardi* CRESSWELL にも似るが、より広く拡がった殻口をもつことで区別される。

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Explanation of Plate 1-2

Plate 1

Boiotremus fukuiensis, n. sp.

Fig. 1. Apertural view of a paratype [NSM-PM15305]. $\times 1$

Fig. 2. Apertural view of the holotype [IGSH K0001], showing the external mold of the aperture. $\times 1$

Plate 2

Boiotremus fukuiensis, n. sp.

Fig. 1. Apertural view of a paratype [NSM-PM15306], showing smooth inner surface of the aperture. $\times 1$

Fig. 2. Squeeze from the holotype, showing the surface ornamentation of the aperture. $\times 1$

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Plate 1

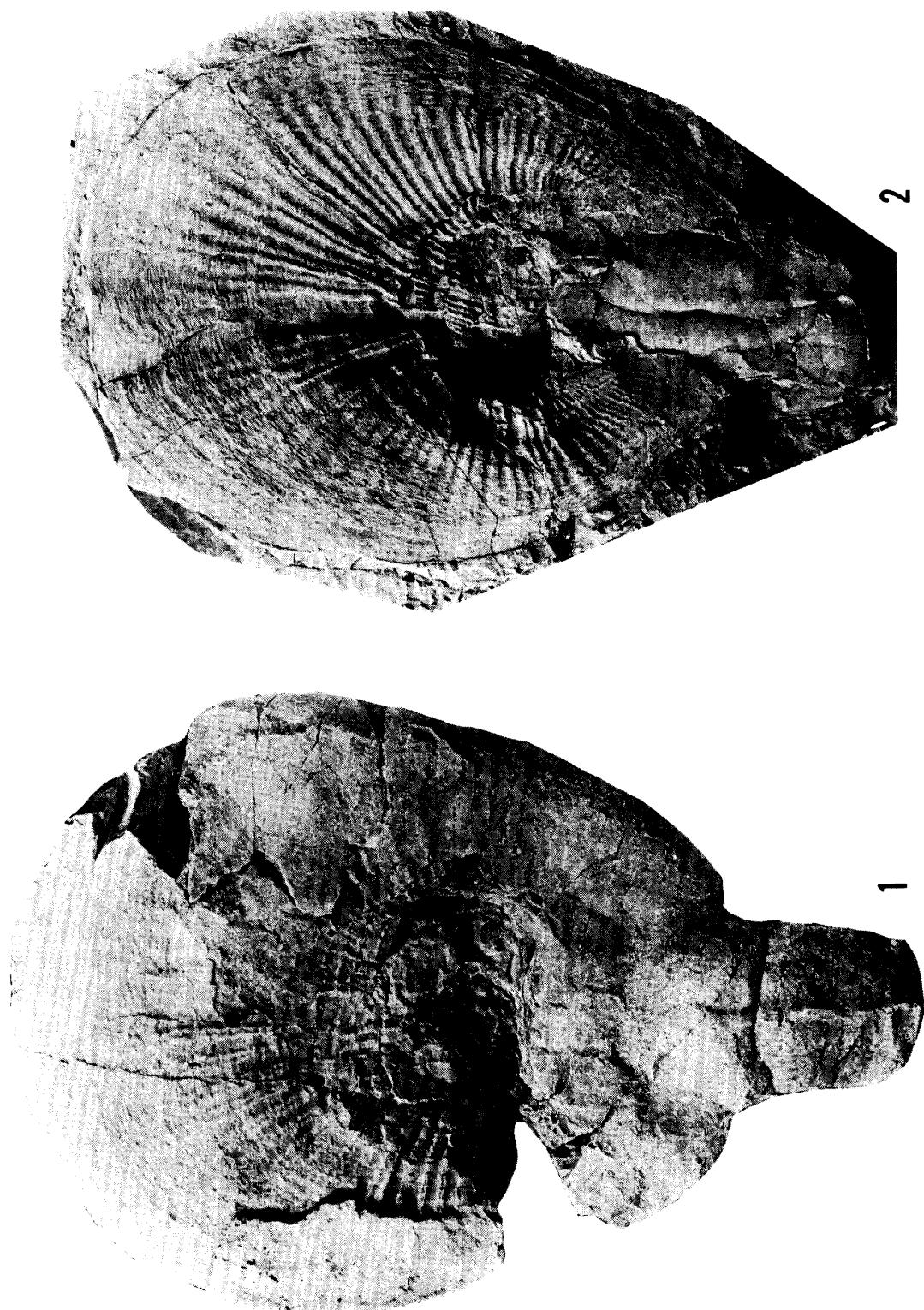


Plate 2

KASE, NISHIDA & NIKO: A Devonian Gastropod from Fukuji

